

STATE BOARD OF TECHNICAL EDUCATION, BIHAR

Scheme of Teaching and Examinations for

IV SEMESTER DIPLOMA IN AUTOMOBILE ENGINEERING / MECH. ENGG.(AUTO)

(Effective from Session 2016-17 Batch)

THEORY

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME							
			Periods per Week	Hours of Exam.	Teacher's Assessment (TA) Marks A	Class Test (CT) Marks B	End Semester Exam.(ESE) Marks C	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	Credits
1.	Theory of Machines & Mechanisms	1625401	03	03	10	20	70	100	28	40	03
2.	Automobile Engines	1633402	04	03	10	20	70	100	28	40	04
3.	Automobile Systems	1633403	03	03	10	20	70	100	28	40	03
4.	Thermal Engineering	1625404	03	03	10	20	70	100	28	40	03
5.	Fluid Mechanics and Machinery	1625405	03	03	10	20	70	100	28	40	03
			Total :- 16				350	500			

PRACTICAL

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME					
			Periods per Week	Hours of Exam.	Practical (ESE)		Total Marks (A+B)	Pass Marks in the Subject	Credits
					Internal(A)	External(B)			
6.	Thermal Engineering Lab	1625406	02	03	15	35	50	20	01
7.	Fluid Mechanics and Machinery Lab	1625407	03	03	15	35	50	20	01
8.	Production Processes Lab	1625408	04	04	15	35	50	20	02
Total :- 09							150		

TERM WORK

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME				
			Periods per Week	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject	Credits
9.	Theory of Machines & Mechanisms (TW)	1625409	02	07	18	25	10	01
10.	Professional Practices- IV(TW)	1625410	04	07	18	25	10	02
11.	Automobile Engines (TW)	1633411	02	15	35	50	20	01
Total :- 08						100		24
Total Periods per week Each of duration One Hour 33					Total Marks = 750			

THEORY OF MACHINES AND MECHANISMS

(MECHANICAL ENGINEERING GROUP)

Subject Code 1625401	Theory						Credits 03
	No. of Periods Per Week			Full Marks			
				:	100		
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	CT	:	20		

CONTENTS: THEORY

Name of the Topic		Hrs/week	Marks
Unit -1	Fundamentals and types of Mechanisms:- 1.1 Kinematics of Machines: - Definition of Kinematics, Dynamics, Statics, Kinetics, Kinematic link, Kinematic Pair and its types, constrained motion and its types, Kinematic chain and its types, Mechanism, inversion, machine and structure. 1.2 Inversions of Kinematic Chain. 1.2.1 Inversion of four bar chain, coupled wheels of Locomotive & Pentograph. 1.2.2 Inversion of Single Slider Crank chain- Rotary I.C. Engines mechanism, Whitworth quick return mechanism, Crank and Slotted lever quick return mechanism. 1.2.3 Inversion of Double Slider Crank Chain- Scotch Yoke Mechanism & Oldham's Coupling. 1.3 Common Mechanisms 1.3.1 Bicycle free wheel Sprocket mechanism. 1.3.2 Geneva Mechanism. 1.3.3 Ackerman's Steering gear mechanism. 1.3.4 Foot operated air pump mechanism.	08	15
Unit -2	Velocity and Acceleration in Mechanism:- 2.1 Concept of relative velocity and relative acceleration of a point on link, angular velocity and angular acceleration, inter- relation between linear and angular velocity and acceleration. 2.2 Drawing of velocity and acceleration diagram of a given configuration, diagrams of simple mechanisms. Determination of velocity and acceleration of a point on link by relative velocity method [Excluding coriolis components of acceleration]. 2.3 Analytical method [no derivation] and Klein's construction to determine velocity and acceleration of different links in single slider crank mechanism.	06	09
Unit – 3	Cams and Followers:- 3.1 Concept, definition and application of Cams and Followers. 3.2 Classification of Cams and Followers. 3.3 Different follower motions and their displacement diagrams like uniform velocity, SHM, uniform acceleration and Retardation. 3.4 Drawing of profile of radial cam with knife-edge and roller follower with and without offset with reciprocating motion (graphical method)	04	08
Unit – 4	Power Transmission:- 4.1 Types of Drives – Belt, Chain, Rope, Gear drives & their comparison. 4.2 Belt Drives – flat belt, V- belt & its applications, material for flat and V- belt, angle of lap, belt length. Slip and creep. Determination of velocity ratio, ratio of tight side and slack side tension, centrifugal tension and initial tension, condition for maximum power transmission(Simple 133umerical) 4.3 Chain Drives – Advantages & Disadvantages, Selection of Chain & Sprocket wheels, methods of lubrication. 4.4 Gear Drives – Spur gear terminology, types of gears and gear trains, their selection for different application, train value & Velocity ratio for compound, reverted and simple epicyclic gear train, methods of lubrication, Law of gearing. 4.5 Rope Drives – Types, applications, advantages & limitations of Steel ropes.	12	14

Unit – 5	Flywheel and Governors:- 1.1 Flywheel – Concept, function and application of flywheel with the help of turning moment diagram for single cylinder 4-S I.C. Engine (no Numericals). Coefficient of fluctuation of energy, coefficient of fluctuation of speed and its significance. 1.2 Governors – Types, concept, function and application & Terminology of Governors. 1.3 Comparison between Flywheel and Governor.	05	06
Unit – 6	Brakes, Dynamometers, Clutches & Bearings:- 6.1 Function of brakes and dynamometer, types of brakes and Dynamometers, comparison between brakes and dynamometer. 6.2 Construction and working of i) shoe brake, ii) Band Brake, iii) Internal expanding shoe brake iv) Disc Brake. 6.3 Concept of Self Locking & Self energizing brakes. 6.4 Numerical problems to find braking force and braking torque for shoe & band brake. 6.5 Construction and working of i) Rope Brake Dynamometer, ii) Hydraulic Dynamometer, iii) Eddy current Dynamometer. 6.6 Clutches- Uniform pressure and Uniform Wear theories. 6.7 Function of Clutch and its application, Construction and working of i) Single plate clutch, ii) Multiplate clutch, iii) Centrifugal Clutch iv) Cone clutch v) Diaphragm clutch. (Simple 134numerical on single and Multiplate clutch). 6.8 Bearings – i) Simple Pivot, ii) Collar Bearing, iii) Conical pivot. Torque & power lost in friction (no derivation). Simple 134numerical.	10	14
Unit – 7	Balancing & Vibrations:- 7.1 Concept of balancing. Balancing of single rotating mass. Graphical method for balancing of several masses revolving in same plane. 7.2 Concept and terminology used in vibration, causes of vibrations in machines, their harmful effects and remedies.	03	04
	Totals	48	70

Text/ Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Theory of machines	Khurmi Gupta	Eurasia publishing House Pvt. Ltd. 2006 edition
Theory of Machine	S.S.Rattan	McGraw Hill companies II Edition
Theory of machines	P.L.Ballaney	Khanna Publication
Theory of machines	Timo Shenko	Wiley Eastern
Theory of machines	Jagdishlal	Bombay Metro – Politan book ltd.
Theory of machines	Ghosh – Mallik	Affiliated East west press
Theory of machines	Beven T.	CBS Publication
Theory of machines	J.E.Shigley	Mc Graw Hill
Kinamatics and Dynamics of machines	George Henry Martin	
The theory of machines through solved problems	J.S rao	

AUTOMOBILE ENGINES
(AUTOMOBILE ENGINEERING GROUP)

Subject Code 1633402	Theory						Credits 04
	No. of Periods Per Week			Full Marks	:	100	
	L	T	P/S	ESE	:	70	
	04	—	—	TA	:	10	
				CT	:	20	

CONTENTS: THEORY

Name of the Topic		Hrs/week	Marks
Unit -1	Engine principles and fundamentals:- 1.1 Introduction 1.2 Basic engine nomenclature. 1.3 Classification of automobile engines. 1.4 Use of engines 1.5 Merits and Demerits of vertical and horizontal engines. 1.6 Four stroke SI and CI engine 1.7 Two stroke cycle engine. 1.8 Comparison of two stroke and four stroke cycle engine 1.9 Reasons for using single cylinder two stroke and four stroke cycle engine.	06	12
Unit -2	Constructional features of automobile engine components:- 2.1 Cylinder block, cylinder liner, types of liner, comparison of dry and wet liners, cylinder head, gaskets, type of gaskets, piston, piston ring pin etc. 2.2 Piston, piston rings, Piston ring joints, piston pin. 2.3 Crank shaft, camshaft, connecting rod, valve, valve cooling, valve mechanisms, valve timing, port-timing diagram, manifolds, silencers, flywheel etc. 2.4 Types of camshaft drives. 2.5 Rotary and reed valve	08	12
Unit – 3	Engine cooling system:- 3.1 Introduction – Purpose of cooling 3.2 Systems- Air cooling system, water cooling systems. 3.3 Comparison of air & water cooling systems. 3.4 Parts of cooling system. Thermostat, water expansion tank, Temperature Indicator Pressure cap, water pump, fan and fan belt, radiator. 3.5 Cooling water additions	04	08
Unit – 4	Lubrication systems:- 4.1 Introduction 4.2 Purpose of lubrication, parts to be lubricated, functions and properties of engine lubricating oils, additives for lubricants, classification of lubricating oils. 4.3 Dry Sump lubrication system, wet sump lubrication system, petrol lubrication system, pressurized lubrication system, splash lubrication system.	06	08
Unit – 5	Fuel Systems:- Part A 5.1 Fuel feed system in petrol engines. 5.2 Mechanical fuel pump, electrical fuel pump 5.3 Principles of carburetion. 5.4 Simple 112arburetor. 5.5 Starting, Idling & slow running, acceleration, Main metering system, choke system. 5.6 S.U. Carburettor, solex 112arburetor. 5.7 Carburettors used in two wheelers and four wheelers.	07	10

	Part B 5.8 Requirement of fuel injection system. 5.9 Various components & Diesel Fuel injection system. 5.10 Types of fuel injection pumps for single and multi cylinder engines, inline and rotary types of fuel injection pumps. 5.11 Types of fuel injectors. 5.12 Air fuel mixture ratio in a petrol and diesel engine and comparison. 5.13 Mixture requirement for Transient conditions.	07	08
Unit – 6	I.C. Engine Testing:- 6.1 Engine Power – Indicated, Brake and Frictional Power. 6.2 Efficiency- Mechanical, Thermal, Relative and Volumetric. 6.3 Fuel Consumption- BSFC 6.4 Morse test, Motoring test. 6.5 Heat Balance Sheet.	10	12
	Total	48	70

Text/ Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
A course in internal combustion engine	M.L Mathur R.P.Sharma	Dhanpat Rai Publication
The Motor vehicle	Newton, Steeds, Garrett.	Butterworth Heinmann.
Automobile Engineering Vol.-2	Dr. Kirpal Singh	Standard Publishers.
Automobile Engineering Vol. I – Engines.	Anil Chikara	Satya Prakashan, New Delhi
Automobile Mechanics	Crouse / Anglin.	TATA McGRAW – HILL
Automobile Engineering	R.B. Gupta	Satya Prakashan
Automotive Technology	H. M. Sethi	Tata McGraw Hill.
Automotive Engines	S. Srinivasan	Tata McGraw Hill.
Autotmobile Power Plants	Ben George Elliot	
A text book of automobile engineering	R.K Rajput	

AUTOMOBILE SYSTEMS
(AUTOMOBILE ENGINEERING GROUP)

Subject Code 1633403	Theory						Credits 03
	No. of Periods Per Week			Full Marks	:	100	
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS: THEORY

	Name of the Topic	Hrs/week	Marks
Unit -1	Front Axle and Steering :- 1.1 Types of front axle – Dead axle, live axle, type of stub axle arrangements- Elliot, reverse Elliot, lamoine, reverse lamoine. 1.2 Front wheel assembly. 1.3 Steering geometry – Caster, camber, king pin inclination, toe in– toe out. Correct Steering angle. 1.4 Under steering and over steering, Turning radius & its effect. 1.5 Construction, working & application of Steering gear box – rack and pinion type, recirculating ball type, worm & roller type. 1.6 Steering linkages & steering column. 1.7 Ackerman Principle & linkage. 1.8 Power assisted steering & its types (Hydraulic & electrical)	12	16
Unit -2	Brakes:- 2.1 Function and necessity. 2.2 Classification of brakes and braking systems. 2.3 Principle, construction and working of –disc brakes, drum brake 2.4 Construction and working of the following–Mechanical braking system, Hydraulic Braking system, Air braking system, Hydraulic operated air assisted braking system. 2.5 Properties of brake fluids and their specifications 2.6 Concept and working of antilock braking system. 2.7 Parking brake.	10	14
Unit – 3	Suspension Systems :- 3.1 Types of suspension systems – Rigid & independent suspension 3.2 Types of Independent suspension system-McPherson strut, wishbone type. 3.3 Semi-elliptical Leaf spring, coil spring , torsion bar arrangement 3.4 Telescopic shock absorber, Gas filled shock absorber, hydraulic shock absorber 3.5 Air Suspension System. 3.6 Anti roll bar, stabilizer bar.	08	12
Unit – 4	Body Engineering:- 4.1 Effect of stream lining on vehicle performance. 4.2 Materials used in body construction and types of bodies. 4.3 Protective and anti corrosive treatments, painting procedure. 4.4 Safety devices –air bags, exhaust brake, emergency brake, Central locking, collapsible steering.	06	10
Unit – 5	Car Heating Ventilation & Air Conditioning System(HVAC):- 5.1 Basic principle- vapour compression cycle, layout and operation of HVAC. 5.2 Types of refrigerant used in car air conditioning and their Properties. 5.3 Human comfort conditions. 5.4 Temperature control system, humidity control.	06	10

Unit – 6	Vehicle Performance :- R.P Resistance faced by the vehicle- Air resistance , rolling Resistance, gradient resistance. 6.2 Define traction, tractive efforts, draw bar pull, gradeability an Acceleration, pitching, Bouncing, Rolling, Sway and yaw. 6.3 Stability of vehicle on turn and slopes (No mathematical Treatment).	06	08
	Total	48	70

Text/ Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Motor Automotive Technology	Anthony Schwaller	Delmar Publisher Inc.
Automotive Service	Tim Gills	Delmar Publisher Inc.
Automobile Engineering Vol. II	Anil Chikara	Satya Prakashan New Delhi
Automobile Mechanics	Crouse / Anglin.	TATA McGRAW – HILL
Automobile Engineering Vol.I	Kirpal Singh	Standard Publication
Automobile Engineering	R.B. Gupta	Satya Prakashan New Delhi
Automotive Mechanics	S. Srinivisan	TATA McGRAW – HILL
ASHRAE HANDBOOK OF HVAC	--	ASHRAE
Automobile Air Conditioning	Boyce H. Dwigins	THOMSON LEARNING
Automotive technology: A system Approach	Jack Erjavec	
Automobile Electrical And Electronic systems	Tom Denton	

THERMAL ENGINEERING
(MECHANICAL ENGINEERING GROUP)

Subject Code 1625404	Theory			Credits		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	ESE	:	70
	03	—	—	TA	:	10
	—	—	—	CT	:	20

CONTENTS: THEORY

	Name of the Topic	Hrs/week	Marks
Unit -1	Fundamental concepts of thermodynamics and various thermodynamic processes:- 1.1 Basic concepts of – i) system ii) surrounding iii) Universe iv) open system v) closed system vi) Isolated system vii) steady flow energy equation viii) internal energy ix) enthalpy x) entropy. 1.2 Zeroth, first and second law of thermodynamics, General gas equation, Characteristics of gas constant, Mol of gas, Universal gas constant, specific heats of ideal gases. 1.3 Thermodynamic processes of ideal gases. Isobaric, Isochoric, Isothermal, Adiabatic and polytropic with representation on P-V and T-S diagram, work done, change in internal energy, change in enthalpy and relation between P,V & T (Derivations only for adiabatic process) 1.4 Air cycles: - P-V and T-S diagram and equations for air standard efficiency of Otto, Diesel & Dual combustion cycle.	08	14
Unit -2	Properties of steam and steam power:- 2.1 Formation of steam, various phases like wet steam, dry saturated Steam, superheated steam. 2.2 Dryness fraction, degree of superheat, sensible heat, Latent heat, calculation of enthalpy of wet, dry saturated & superheated steam using steam table. 2.3 Study of boilers like three pass packaged type boiler, Water Tube & Fire Tube Boiler. Mountings – Bourdan Pressure Gauge, Safety valves, Water level Indicator and fusible Plug. Accessories – Economiser, superheater and air pre-heater. 2.4 Steam condenser: Principle, Function, locations in steam power plant. Surface condenser & its Applications. 2.5 Steam Turbines: Classification of turbines, construction and working of Impulse and Reaction turbine. Application of equation of continuity to steam turbine.	08	14
Unit – 3	Air Compressors:- 3.1 Various uses of compressed air and classification of compressors. 3.2 Construction and working of single stage and two stage reciprocating air Compressors with P.V diagram. Necessity of multistaging and intercooling. 3.3 Construction & working of rotary compressors i) Centrifugal compressor ii) Axial flow compressor iii) Screw compressor 3.4 Comparison of various compressors 3.5 Air compressor terminology like i) Free air delivered ii) Capacity of compressor iii) Piston displacement iv) I.P., B.P.R. Volumetric efficiency vi) Isothermal efficiency vii) Overall Isothermal or Compressor efficiency	06	10

Unit – 4	Gas Turbines:- 4.1 Brayton cycle- P. V. diagram and thermal efficiency 4.2 Classification of gas turbines. 4.3 Construction and working of gas turbines open cycle ii)closed cycle gas turbines, P.V. & T.S diagrams. 4.4 Turbojet & turboprop engine.	04	06
Unit – 5	Sources of Energy & Power plants:- 5.1 Classification of various conventional and non-conventional sources of energy. 5.2 Construction and working of power plants based on conventional energy sources : i) Thermal power plant ii) Diesel power plant iii) Gas turbine power plant. 5.3 Parameters of site selection : 5.4 Study the working and construction of non- conventional energy sources. I) Solar ii) Bio-diesel	06	10
Unit – 6	Heat transfer:- 6.1 Modes of heat transfer–conduction, convection and radiation. 6.2 Conduction – Fourier's law , thermal conductivity, conduction through cylinders, thermal resistance, composite walls, combined conduction and convection. 6.3 Thermal radiation, absorptivity, transmissivity, reflectivity, emissivity, black and gray bodies, Stefan-Boltzman law, Heat transfer by radiation. 6.4 Heat transfer in condenser and radiator.	06	08
Total		48	70

Text / Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
A Text book of Thermal Engineering	R. S. Khurmi & J. K. Gupta	S. Chand & Co. Ltd.
Elements of Heat Engines (Vol. I, II & III)	Patel and Karamchandani	Acharya Book Depot.
Thermal Engineering	A. S. Rao	Satya Prakashan
Thermal engineering	B. K. Sarkar	Tata McGraw Hill
Engineering Thermodynamics	Jones & Dugan	Prentice Hall of India
Thermodynamics	Yunus Cengel & Mike Boles	Tata McGraw Hill
Thermodynamics for Engineers.	Jesse S.Doolittle & Francis J Hale	John Willey & Sons
A course in Thermal Engineering	S. Domkundwar, Dr C.P. Kothandaraman & A.V. Domkundwar	Dhanpat Rai & Co.(P) Ltd, New Delhi
Power Distribution Planning	H Lee Willis	
Heat Power	K.C. Pal	

FLUID MECHANICS AND MACHINERY
(MECHANICAL ENGINEERING GROUP)

Subject Code 1625405	Theory						Credits 03
	No. of Periods Per Week			Full Marks	:	100	
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

CONTENTS: THEORY

Chapter	Name of the Topic	Hours	Marks
Unit-01	Properties of fluid : <ul style="list-style-type: none"> Density, Specific gravity, Specific Weight, Specific Volume Dynamic Viscosity, Kinematic Viscosity, Surface tension, Capillarity Vapour Pressure, Compressibility 	04	04
Unit-02	Fluid Pressure & Pressure Measurement : <ul style="list-style-type: none"> Fluid pressure, Pressure head, Pressure intensity Concept of absolute vacuum, gauge pressure, atmospheric pressure, absolute pressure. Simple and differential manometers, Bourden pressure gauge. Concept of Total pressure on immersed bodies, center of pressure. Note: Numericals on Manometers, Total Pressure & Centre of pressure	09	12
Unit-03	Fluid Flow : <ul style="list-style-type: none"> Types of fluid flows Continuity equation Bernoulli's theorem Venturimeter – Construction, principle of working, Coefficient of discharge, Derivation for discharge through venturimeter. Orifice meter – Construction, Principle of working, hydraulic coefficients, Derivation for discharge through Orifice meter Pitot tube – Construction, Principle of Working Note :- Numericals on Venturimeter, orifice meter, pitot tube	09	12
Unit-04	Flow Through Pipes : <ul style="list-style-type: none"> Laws of fluid friction (Laminar and turbulent) Darcy's equation and Chezy's equation for frictional losses. Minor losses in pipes Hydraulic gradient and total gradient line. Hydraulic power transmission through pipe Note: Numericals to estimate major and minor losses	05	06
Unit-05	Impact of jet : <ul style="list-style-type: none"> 1.10 Impact of jet on fixed vertical, moving vertical flat plates. 1.11 Impact of jet on curved vanes with special reference to turbines & pumps Note - Simple Numericals on work done and efficiency	09	08
Unit-06	Hydraulic Turbines : <ul style="list-style-type: none"> 2.5 Layout of hydroelectric power plant. 2.6 Features of Hydroelectric power plant. 2.7 Classification of hydraulic turbines. 2.8 Selection of turbine on the basis of head and discharge available 2.9 Construction and working principle of Pelton wheel, Francis and Kaplan turbine. 2.10 Draft tubes – types and construction, Concept of cavitation in turbines 2.11 Calculation of Work done, Power, efficiency of turbine. 	10	10

Unit-07	A] Centrifugal Pumps : 3.6 Construction , principle of working and applications 3.7 Types of casings and impellers. 4.4 Concept of multistage 4.5 Priming and its methods, Cavitation 4.6 Manometric head, Work done, Manometric efficiency, Overall efficiency, NPSH 4.7 Performance Characteristics of Centrifugal pumps 4.8 Trouble Shooting 4.9 Construction, working and applications of submersible, jet pump Note :- Numericals on calculations of overall efficiency and power required to drive pumps.	10	10
	B] Reciprocating Pump : 4.10 Construction ,working principle and applications of single and double acting reciprocating pumps. 4.11 Concept of Slip, Negative slip, Cavitation and separation 4.12 Use of Air Vessel. 7.11 Indicator diagram with effect of acceleration head & frictional head. Note:- No Derivations and Numericals on reciprocating pumps.	08	06
	Total	64	70

Text/Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Hydraulic, fluid mechanics & fluid machines	Ramamrutham S.	Dhanpat Rai and Sons New Delhi
Hydraulics and fluid mechanics including Hydraulic machines	Modi P. N. and Seth S. M.	Standard Book House. New Delhi
Fluid Mechanics	Streeter Victor, Bedford K.W., Wylie E.B	McGraw Hill Int.
One Thousand Solved Problems in Fluid Mechanics	K. Subramanya	Tata McGraw Hill

Pump manufactures' catalogs such as Kirloskar Brothers, KSB, Kishor pumps etc.

Text / Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Elements of Workshop Technology. Vol. – I & II	S. K. Hajra Choudhury. A. K. Hajra Choudhury.	Media Promoters & Publishers Pvt. Ltd. Mumbai.
Workshop Technology Vol. – I & II.	H. S. Bawa	Tata McGraw-Hill Publishing Co. Ltd. New Delhi.
Workshop Technology Part- I, II & III	Dr. W. A. J. Chapman	ELBS & Edward Arnold (Publishers) Ltd., London.
Manufacturing Processes	B. H. Amstead, Phillip Ostwald, Myronl Begeman.	John Wiley & Sons (Eighth Edition)
CNC machines programming & applications.	Aditan, Pabla	Willey Estarn Ltd.
Production Technology	H.M.T.	H.M.T.
R. Video Cassettes and CDs: Video cassettes developed by: -- Electronics Trades and Technology Development Corporation (A Govt. of India undertaking), Akbar Hotel Annex , Chanakyapuri , New Delhi – 110 02. Learning Materials – CBT Packages developed by N.I.T.T.T.R, Bhopal.		
Uday Vaidya	Composites for Automotives	
Walter Fung	Textiles in automotive engineering	

THERMAL ENGINEERING LAB
(MECHANICAL ENGINEERING GROUP)

Subject Code 1625406	Practical						Credits 01
	No. of Periods Per Week			Full Marks	:	50	
	L	T	P/S	ESE	:	50	
	—	—	02	Internal	:	15	
	—	—	—	External	:	35	

CONTENTS: PRACTICAL

Practical: **Skills to be developed:**

Intellectual Skill :

- 1) Understand different sources of energy and their applications.
- 2) Understand various concepts and fundamentals of thermodynamics.
- 3) Understand concepts and laws of ideal gasses.
- 4) Understand vapour processes, steam boilers and different mountings and accessories.
- 5) Understand modes of heat transfer and concept of heat exchanges.
- 6) Interpret steam tables, mollier chart and relationship between different thermodynamic properties.

Motor Skills :

- 3) Collect and write technical specifications of photovoltaic cells and identify different components on panels of photovoltaic cells.
- 4) Conduct trial on the setup for calculation of thermal conductivity of metal rod
- 5) Trace path of flue gases and water steam circuit in a boiler.
- 6) Conduct trial on solar water heating system.

List of practical:

- Collection of technical data and specification of photovoltaic cell by referring to manufacturers' catalogues.
- Study and Trial on solar water heating system.
- Report on visit to wind power generation plant / biogas plant / hydraulic power plant.
- Trace the flue gas path and water-steam circuit with the help of boiler model and write a report.
- Report on visit to sugar factory / Dairy / steam power plant with specifications of boiler and list of mountings and accessories.
- Calculation of thermal conductivity of a solid metallic rod.
- Verification of Stefan-Boltzman's law
- Study and compare various heat exchangers such as radiators, evaporators, condensers, plate heat exchangers etc.

Numericals on vapour processes and ideal gas processes (minimum two problems on each)

FLUID MECHANICS & MACHINERY LAB

(MECHANICAL ENGINEERING GROUP)

Subject Code 1625407	Practical						Credits
	No. of Periods Per Week			Full Marks	:	50	01
	L	T	P/S	ESE	:	50	
	—	—	03	Internal	:	15	
	—	—	—	External	:	35	

CONTENTS: PRACTICAL

Practical: Skills to be developed:

Intellectual Skills:

1. Select and use appropriate flow measuring device.
2. Select and use appropriate pressure measuring device.
3. Analyze the performance of pumps and turbines.

Motor Skills:

1. Use flow measuring device.
2. Use pressure measuring device.
3. Operate pumps and turbines.

List of Practical:

1. Calibration of Bourden pressure gauge with the help of Dead Weight Pressure gauge.
2. Verification of Bernoulli's Theorem.
3. Determination of Coefficient of Discharge of Venturimeter.
4. Determination of Coefficient of Discharge, coefficient of contraction and coefficient of velocity of orifice meter.
5. Determination of coefficient of friction of flow through pipes.
6. Trial on Pelton wheel to determine overall efficiency.
7. Trial on centrifugal pump to determine overall efficiency.
8. Trial on reciprocating pump to determine overall efficiency.

PRODUCTION PROCESSES LAB
(MECHANICAL ENGINEERING GROUP)

Subject Code 1625408	Practical						Credits 02
	No. of Periods Per Week			Full Marks	:	50	
	L	T	P/S	ESE	:	50	
	—	—	04	Internal	:	15	
	—	—	—	External	:	35	

CONTENTS: PRACTICAL

Note: Six hours practical work will be performed during practical examination Student will prepare one jobs from the following list of practicals.

List :

- 1) Electric welding/Gas welding jobs.
- 2) Industrial visit to observe plastic processing shop and report on the visit.
- 3) One job on lathe containing the operations like plain turning, threading, boring, taper turning.
- 4) One job on CNC lathe containing the operations like plain turning, taper turning and curvature.
(Group of two students , each group must use different program for different job dimensions)
- 5) One job containing drilling, milling, reaming, gear cutting (spur gear) per job max. two students.
- 6) One job containing surface grinding / cylindrical grinding for tolerances
 ± 30 micron,(For the job already made on milling machine /lathe).
- 7) One assignment on accessories & attachment – chucks, mandrels, carrier and catch plates rests, face plate and angle plate, grinding attachment used on lathe.
- 8) One assignment on accessories & attachment, work holding & tool holding devises used on milling machine.
- 9) One assignment each on shaper, planer, boring machine, broaching machine.
- 10) Fittings related jobs.
One assignment on types of grinding wheels.

THEORY OF MACHINES & MECHANISMS -TW
(MECHANICAL ENGINEERING GROUP)

Subject Code 1625409	Term Work						Credits
	No. of Periods Per Week			Full Marks	:	25	01
	L	T	P/S	Internal	:	07	
	—	—	02	External	:	18	

CONTENTS: TERM WORK

List of Term Work :- (Perform any four) -

- 1) Draw the profile of radial cam for the given motion of follower. (At least four problems)
- 2) Determine the radius of rotation of flyball for different speed of governor and draw a graph between radius of rotation versus speed.
- 3) Dismantling and assembly of mechanically operated braking mechanism for two wheelers.
- 4) Determination of power transmitted by any belt drive using any one dynamometer.
- 5) Dismantling and assembly of multiplate clutch of two-wheeler.
- 6) Determine graphically balancing of several masses rotating in a single plane.

PROFESSIONAL PRACTICES IV -TW

(MECHANICAL ENGINEERING GROUP)

Subject Code 1625410	Term Work			Credits		
	No. of Periods Per Week			Full Marks	:	25
	L	T	P/S	Internal	:	07
	—	—	04	External	:	18

CONTENTS: TERM WORK						Hrs/week
Unit -1	Industrial Visits Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form a part of the term work. TWO industrial visits may be arranged in the following areas / industries i) Garage / service station. (Engine/chassis components, subsystems, their location.) ii) Vehicle manufacturing company.(Component manufacturing processes.) iii) Engine FIP testing unit. iv) Sugar Factory / SSI / Chemical Factory v) Machine shop having CNC machines.					14
Unit -2	Lectures by Professional / Industrial Experts to be organized from any of the following areas (3 Lectures : 2 hrs duration each): i) Interview Techniques. ii) Power steering iii) Antilock braking system iv) Air suspension system v) Automotive safety systems vi) Car heating, ventilation & air conditioning system. vii) Vehicle performance viii) Alternative sources of energy (wind, solar and biomass) ix) Use of internet					06
Unit – 3	Information Search: Information search through manufacturers, catalogue, internet, magazines; books etc. and submit a report of max. 10 pages (Any Two topics) Following topics are suggested : i) Two wheeler engine specifications. ii) Four wheeler engine specifications iii) Engine lubricants & additives iv) Automotive gaskets and sealants v) Engine coolants and additives vi) Two wheeler 130umerical130. vii) Four wheeler 130umerical130. viii) Fuel injection pumps ix) Power steering x) Filters xi) Different drives/Transmission systems in two wheelers. xii) Types of Rolling Contact bearings – construction, mountings, applications, cost and suppliers. xiii) Radiators xiv) Maintenance procedure for solar equipment. xv) Drilling machines-types, tools and operation					08

Unit – 4	Seminar : Seminar topic should be related to the subjects of fourth semester. Each student shall submit a report of at least 10 pages and deliver a seminar (Presentation time – 10 minutes)	08
Unit – 5	Mini Project / Activities : a) Prepare one model – cardboard / acrylic / wood / metal / etc such as : i) Elliptical Trammel ii) Pantograph iii) Coupling iv) Geneva Mechanism v) Cam & follower mechanism <div style="text-align: center;">OR</div> b) Dismantling and assembly (e.g. Piston – connecting rod, Cylinder head – valves, Tool post, valves etc.) Take measurement and prepare sketches of different parts. <div style="text-align: center;">OR</div> c) Make a small decorative water fountain unit. <div style="text-align: center;">OR</div> d) Toy making with simple operating mechanism <div style="text-align: center;">OR</div> e) How it works ? (students to collect information on working of small assemblies or mechanisms) Such as - - door closer, mobile charger , microwave oven , washing machine , gas lighter , oil-can , grease gun , electromagnets , burglar alarm , central lock (automobile).	12
Total		48
Note: The topics suggested under various activities (Sr.No.1 to 4) are only suggestive and may serve as guidelines to the teachers. Any other equivalent topics or activities may be considered to improve professional skills of the learner.		

Text/ Reference Books:-	
Titles of the Book	Name of Authors
New directions in professional Practices	Diane .T Marsh
Performing Arts Management: A handbook of professional practices	Tobie S Stein,Jessica Bathurst

AUTOMOBILE ENGINES -TW

(AUTOMOBILE ENGINEERING GROUP)

Subject Code 1633411	Term Work						Credits
	No. of Periods Per Week			Full Marks	:	50	
	L	T	P/S	Internal	:	15	
	—	—	02	External	:	35	

CONTENTS: TERM WORK

- 1) Operate a cut section model to explain two- stroke cycle engine.
- 2) Operate a Cut section model to explain four- stroke CI and SI engine
- 3) Dismantling and reassembling of following types of engines. (Any one from each category)
 - Moped, scooter, motorcycle Single cylinder petrol or diesel engines.
 - Four stroke petrol or diesel engines.
- 4) i) Remove the radiator from the vehicle, check it for leak, clean and reverse flush the radiator and refit.

ii) Remove the water pump, clean, inspect and refit.

iii) Remove the thermostatic valve, check and refit
- 5) Remove the 113arburetor from the engine of motor cycle, identify and check the components, draw the circuits and refit.
- 6) Remove the 113arburetor from the car engine, identify and check the components, draw the circuits and refit.
- 7) Open the fuel injection pump and fuel injector, identify the components – draw sketch and reassemble.
- 8) Perform a trial on a Multi-cylinder engine. Prepare a heat balance sheet.
- 9) Perform a Morse test on a Multi-cylinder engine.